# -MC data & Real data Comparison-

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- Test compatibility between MC data and REAL data using Kolmogorov test.

- Compatibility is necessary for neural network training.

- Compared period 3 "not muons" data (both for MC and Real) using SF1 decoder (SF2 gives way to many hits and the tracking in the SF's fails).

- Used the side variables to compare.

nsfhitrec = Total number of Scintillating Fiber

pulse_hgt = Total Pulse Height of SF's

ntksf = Total number of SF tracks

nsfh_st1 = Percentage of SF hits in Station 1

nsfh_st2 = Percentage of SF hits in Station 2

nsfh_st3 = Percentage of SF hits in Station 3

nsfh_st4 = Percentage of SF hits in Station 4

ndchitrec = Total number of DC hits

ntkdc = Total number of DC Tracks

emtotreco = Total Energy deposition in the EMCAL

nclu = Number of Clusters in the EMCAL

avene = Average Cluster energy in the EMCAL

nmidhitrec = Total number of hits in the Muon (MID)

nmidhitrec_-sc = Total number of hits in the Scintillating Tubes of the MID

nmd_st1 = Percentage of MID hits in Wall A

nmd_st2 = Percentage of MID hits in Wall B

nmd_st3 = Percentage of MID hits in Wall C

ntkfin = Total number of "final" tracks

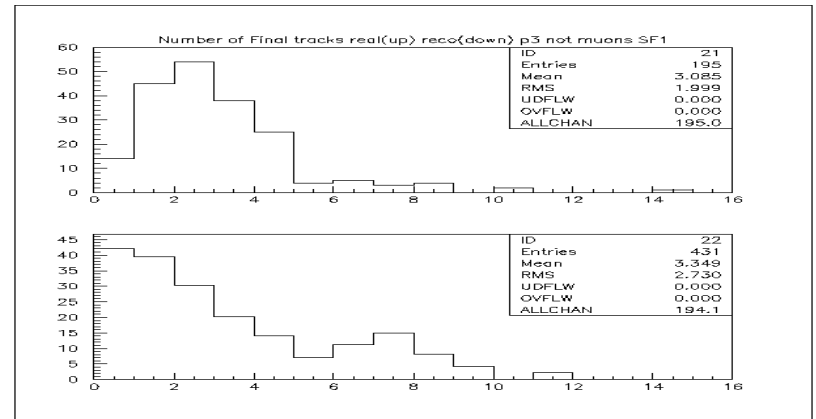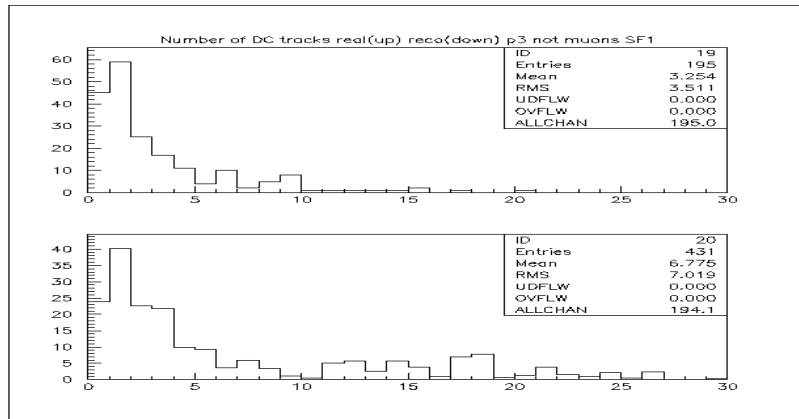# -Distributions of the previous variables 1-
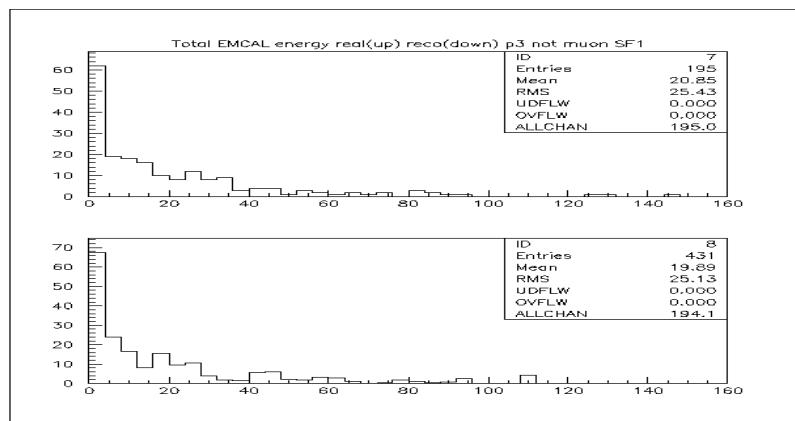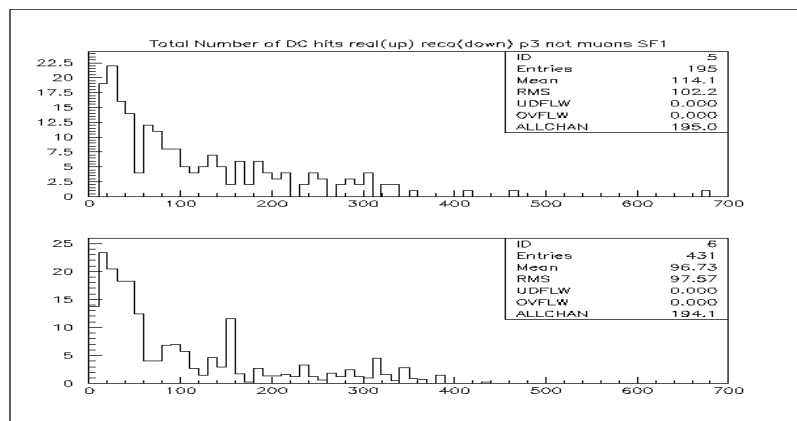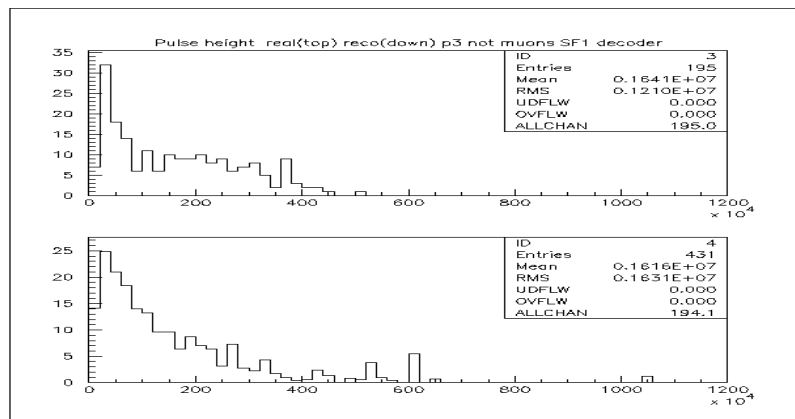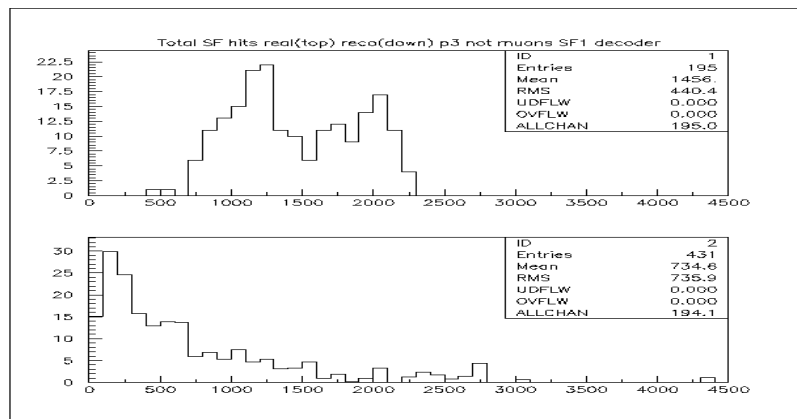
1. Total Number of SF hits 2. Total Pulse height   3. Total Number of DC hits   4. Total energy in the EMCAL

Real data (up) - MC data (down)

2

-Distributions of the previous variables 2-
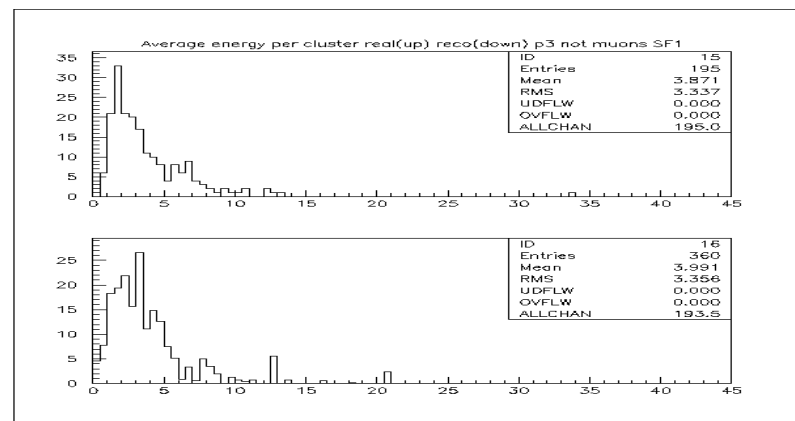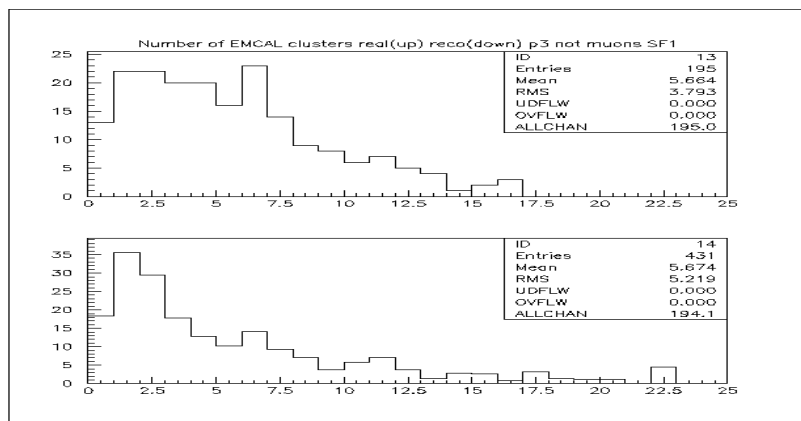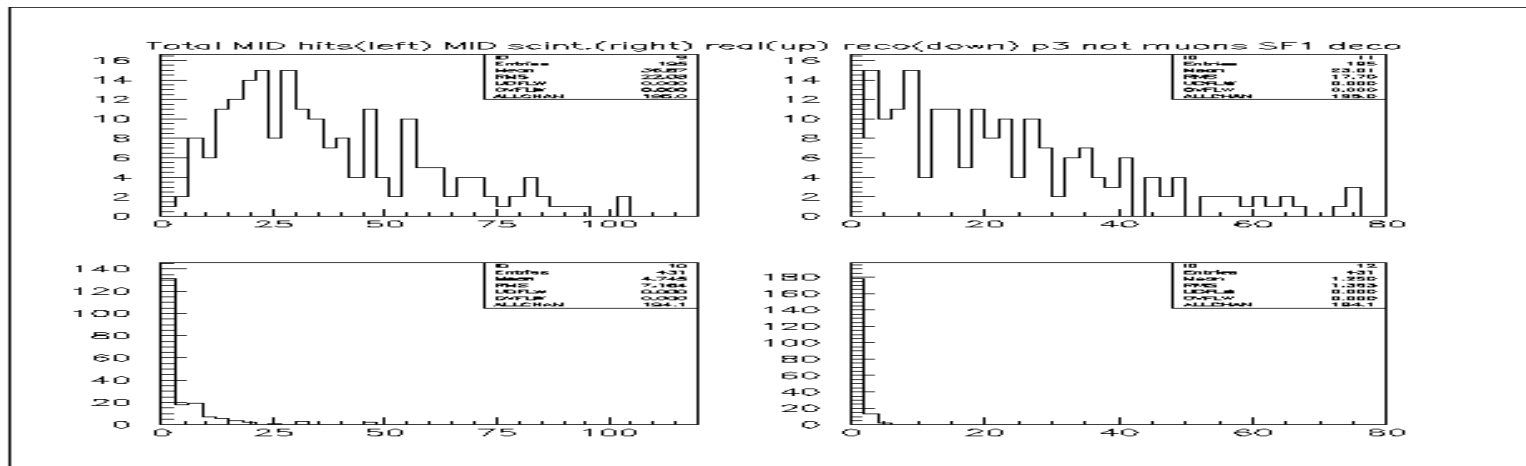
1. Total Number of MID hits (up) & Total Number of Scintillator's hits (down) 2. Total Number clusters

3. Average Cluster energy

Real data (up) - MC data (down)

-Distributions of the previous variables 3-
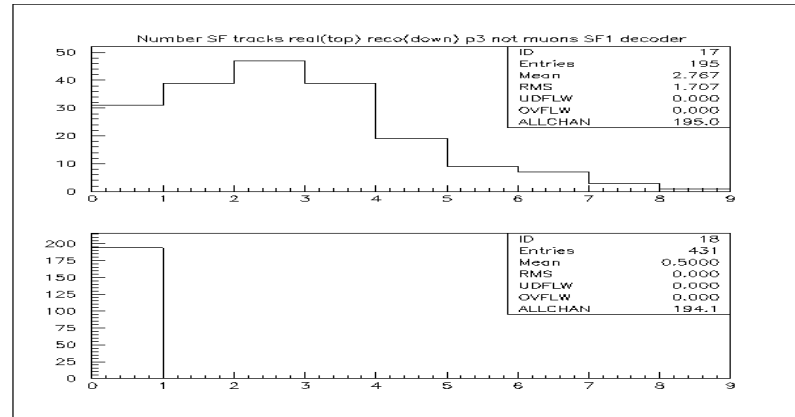
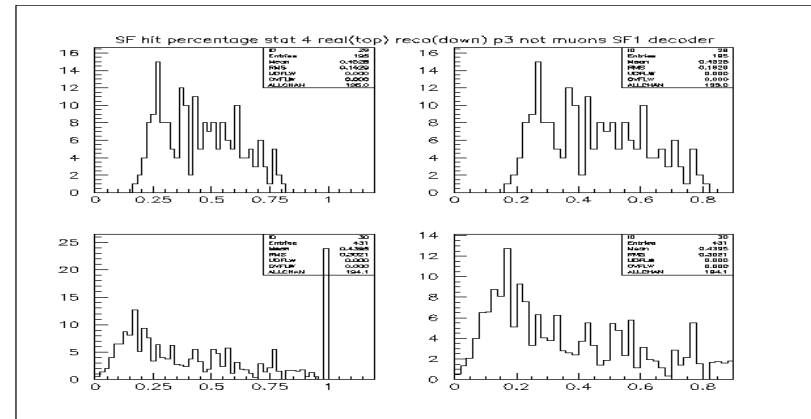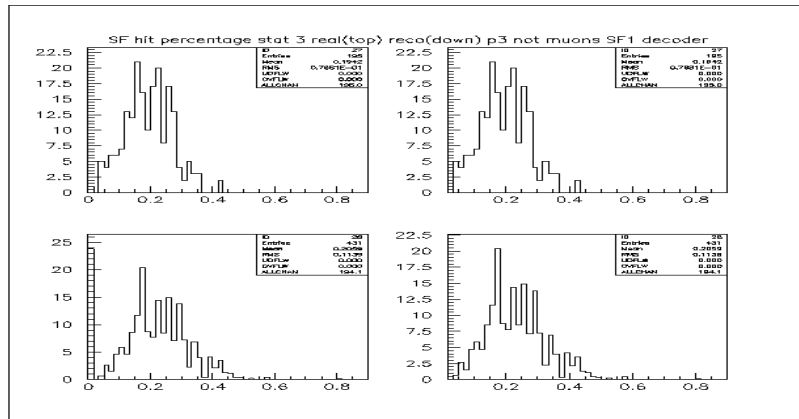
1. Total Number of SF tracks 2. Total Number of DC tracks   3. Total Number of "final" racks

Real data (up) - MC data (down)

-Distributions of the previous variables 4-
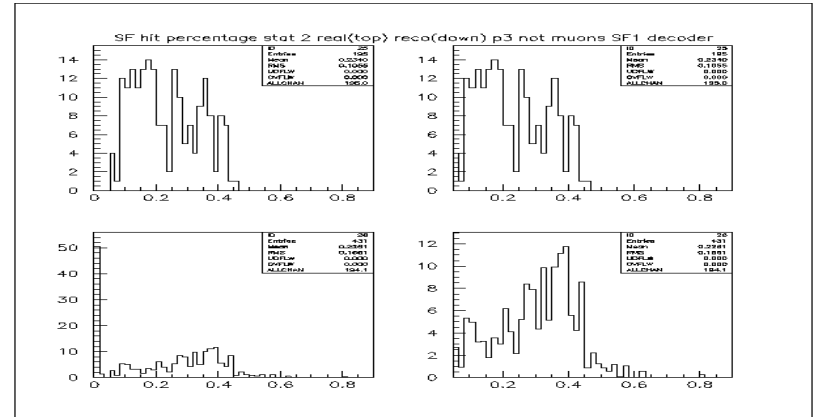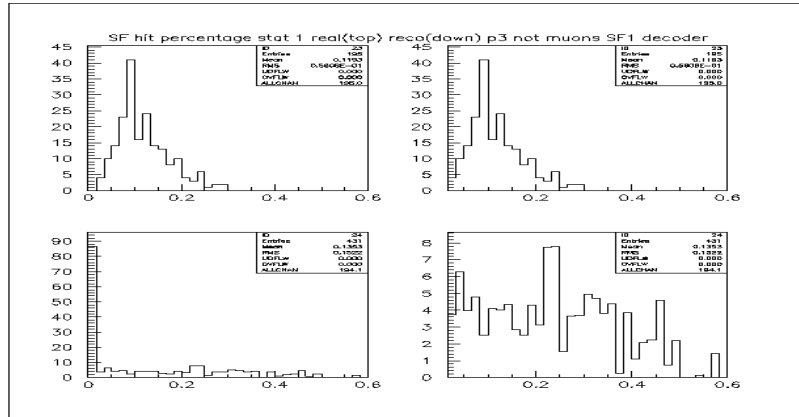
1. Percentage of SF hits in Station 1 2. Station 2   3. Station 3 4.Station 4

Real data (up) - MC data (down) (left and right the same histos with different x-axis limits)

-Distributions of the previous variables 5-

Persentage MID hits in A B C st (1,2,3 col) real(1,3 row) reco(2,4 row) p3 not m
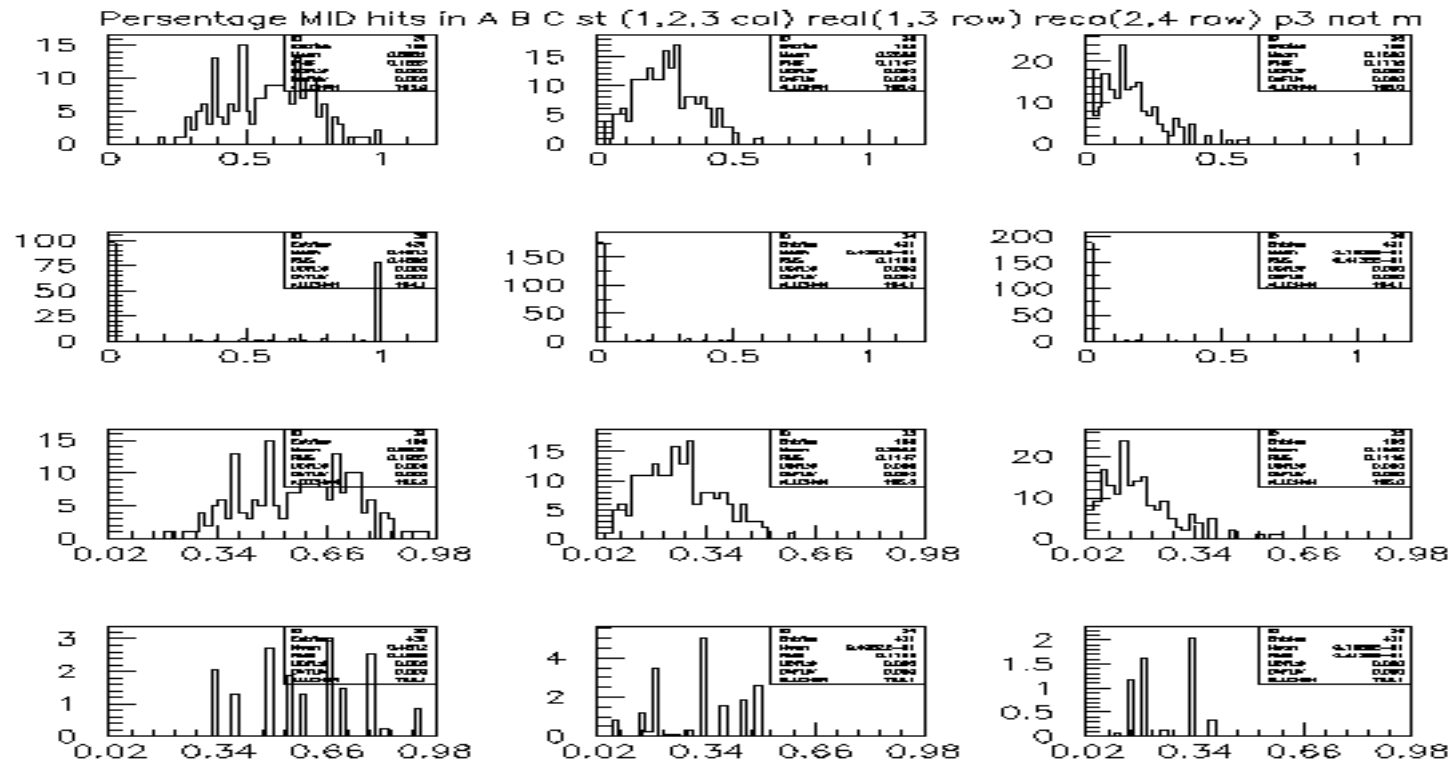
- Percentage of MID hits in A B C Wall (1 , 2, 3, column) for real data (1,3 row) and MC data (2,4 rows)

- Kolmogorov test-

- Used **HDIFF** routine of **HBOOK** that examines the statistical **compatibility in shape** between two histograms[HBOOK Manual p.101].

- The statistical test (**Kolmogorov test**) **distinguishes** between the **null hypothesis** (the 2 histograms are compatible) and the **alternative** of the null hypothesis. It calculates the **probability** that these 2 histograms come form the same parent distribution.

- The **confidence level** is the **probability** of **rejecting** the **null hypothesis** when it is in fact true.

- The **criterion** we use is **0.01**. If the **probability** is **greater** than **0.01** then we accept the **2 histograms** as **compatible** and with that criterion (0.01) truly compatible histograms will fail the test exactly 1% of the time.

- The most commonly used criteria are 0.05 0.01 0.001 and if the probability is of the order of 6×10^{-5} or less [Phys.Rev.D particles and Fields p.161 (1996)] then 2 histograms are considered totally incompatible.

- Results of the Kolmogorov test & Conclusions-

- With the **0.01 criterion** only the following variables are considered compatible: pulse_hgt, emtotreco, nclu and avene

- With the **0.001 criterion** ndchitrec ntkfin and nsfh_st3 are added to the list of compatible histos.

- We think that the E872 Monte Carlo is describing the E872 data in an acceptable way apart from the SF and MID system. The MID system could be improved by considering only the wire chamber hits. The SF system might be improved by making a better thresholding on one hand and a better Monte Carlo on the other.

Histo ID	Variable	Kolmogorov Probability
1&2	nsfhitrec	0.000000
3&4	pulse_hgt	0.072083
5&6	ndchitrec	0.001431
7&8	emtotreco	0.819288
9&10	nmidhitrec	0.000000
11&12	nmidhitrec_sc	0.000000
13&14	nclu	0.012717
15&16	avene	0.648560
17&18	ntksf	0.000000
19&20	ntkdc	0.000002
21&22	ntkfin	0.004849
23&24	nsfh_st1	0.000000
25&26	nsfh_st2	0.000000
27&28	nsfh_st3	0.004136
29&30	nsfh_st4	0.000000
31&32	nmd_st1	0.000000
33&34	nmd_st2	0.000000
35&36	nmd _st3	0.000000